

Virginia Unmanned Systems Commission



Interim Report of Recommendations

January 12, 2016

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Executive Summary

The Virginia Unmanned Systems¹ (UMS) Commission was established June 12, 2015 by Governor Terry McAuliffe's Executive Order 43. The Commission was established to identify the state of the UMS industry in Virginia, identify challenges and needs of the industry that may be met with Virginia assets, provide recommendations that will encourage the development of the UMS industry in Virginia, and develop the value proposition that will provide a basis for marketing and that will position Virginia for emerging needs and applications.

The UMS system industry is in early stage innovation characterized by experimentation in the technology and business models, and is attempting to grow in an ever-evolving policy and regulatory environment. Virginia possesses an incredible array of capabilities and assets to assist the industry, not only in this early innovation but also in the many capabilities that will be in sustained demand as the technology is matured, commercialized, and deployed. The difficulty in developing a value proposition is not in finding one, but in prioritizing which ones to foster and promote. A unique strength of Virginia may be found in the integration of our capabilities, to promote technology development in all domains (land/sea/air) with our educational system and expertise in platform agnostic technologies such as cyber security. Virginia fosters the entire value chain from concepts to commerce.

Executive Order 43 requires that "The Commission shall provide an interim report to the Governor of recommendations by November 30, 2015." This report summarizes the observations and interim recommendations to date. The report will summarize initial findings, barriers, and recommendations in the categories of marketing, education, policy/regulatory, and in the innovation and business environment. Specific near term actions are proposed.

Interim Recommendations

1. Establish an Unmanned Systems Focal Point

Define the attributes, functions, and form of an UMS focal point for Virginia and implement. This focal point is more than a singular entry point for in-bound inquiries about Virginia's capabilities, it should also actively reach out to firms across the UMS sector and supporting industries to understand and develop solutions for their needs. Currently these functions are performed on an ad hoc basis by the Office of the Secretary of Technology, the Virginia Economic Development Partnership, and the Mid-Atlantic Aviation Partnership.

There is no singular voice for the emerging and rapidly evolving UMS industry (in Virginia) that is (1) proficient in industry domain knowledge and trends across air, land, and maritime markets as well as the industries and services that support all UMS domains, (2) familiar with assets and capabilities across the Commonwealth, (3) able to effectively market the Commonwealth, (4) is singularly focused on this industry, and (5) otherwise fosters the growth of the UMS industry across the breadth of domains and assets that Virginia has to offer.

¹ In this report "unmanned systems" refers to marine, land, and aerial vehicles that can operate absent a human operator on board. These vehicles are ultimately under human control at the mission level but may be highly automated or perform with various degrees of autonomy. Examples include robotic maritime vehicles, unmanned aerial systems, and land vehicles that are unmanned or that may carry occupants that are not required to perform primary control of the vehicle.

2. Marketing

Update the 2014 report “The Future of Unmanned System in Virginia” and distribute it to policy makers, stakeholders, economic development officials, and the industry at large. Subsequently, begin and sustain a comprehensive marketing campaign.

The breadth and depth of Virginia’s UMS industry (education, workforce, assets for testing in air/land/sea domains), is not widely recognized; it will require significant effort to expand awareness of the Commonwealth’s capabilities.

3. Financial and Non-Financial Incentives

Incentives can play a pivotal role in a state’s ability to compete and the UMS industry is no exception. In order to excel, it is imperative that we analyze the financial incentives offered by Virginia against: 1. the needs of small and large firms in the emergent UMS space to determine opportunities for leverage and existing gaps 2. incentives offered by competing states, and 3. infrastructure investments being made to attract Research and Development (R&D). Advocate for appropriate financial and non-financial incentives and assistance to retain existing firms while attracting entrants.

Financial incentives currently available in Virginia are generally geared towards companies with larger capital, job growth numbers, and other requirements such as wage levels. Success metrics are often tied to job growth and capital investment. For industries such as UMS that are still in the very early stages of growth these numbers can be difficult to attain².

4. Policy and Regulatory

Overly restrictive “knee-jerk” policies and regulations (even when well-intentioned) have the ability to stifle or even destroy a young industry. The Commonwealth should avoid implementing premature Commonwealth-specific policies and/or regulations beyond those required by the Federal government and insurance industry. Special precaution should be taken prior to enacting legislation to determine if existing laws provide the desired protections. In the aerial domain, while other states and local governments are trying to restrict Unmanned Aerial System (UAS) activity, Virginia should lead the charge with responsible yet minimal policy and regulation.

To date, Virginia has maintained a UMS-friendly regulatory environment relative to other states.

² An exception is the Commonwealth Research Commercialization Fund which is geared towards smaller firms and provides awards of up to \$50,000 to for-profit technology companies to commercialize qualified technologies (including unmanned systems). This funds also provides SBIR and STTR matching funds programs of up to \$50,000 in the same technology areas.

Introduction

The Virginia Unmanned Systems (UMS) Commission was established June 12, 2015 by Executive Order 43. The order requires that “The Commission shall provide an interim report to the Governor of Recommendations by November 30, 2015.” This report will summarize the findings, observations and early recommendations of the Commission. Many of these initial recommendations will require further research to resolve options in sufficient depth for advocacy and implementation. This report is organized as follows. Major sections align with (1) the value proposition and marketing of Virginia, (2) the innovation and business environment, (3) the workforce and education enablers, and (4) the policy and regulatory environment. Within each section findings, barriers, and recommendations will be summarized within air, land, and maritime domains. These interim recommendations result from two full Commission meetings, one meeting of each work group, and written inputs from commissioners and the special advisors.

An Emerging Industry

Of importance to a Commonwealth strategy is the emerging state of the industry. Experimentation, attempts to make a technology function as desired, and exploration of business models characterize the early stages of technology development. The performance and deployment of the technology rapidly accelerates once the technology and business models cross a threshold of viability; research turns to improvements in performance and efficiencies in manufacturing and distribution. Unmanned systems are in the early stages of innovation and are developing basic functions today such as a means of flying beyond line of sight, or fully automating the automobile driving task or underwater vehicle operation. As these problems are solved, efforts will turn to improvements in platforms, and to higher demand for services provided by supporting industries such as software applications, sensors, advanced manufacturing, data services, and cyber security to name a few. Virginia must develop a solid ecosystem in order to take full advantage of the next and longer lasting phase leading up to industry maturity.

Land Systems Potential

Unmanned (i.e., autonomous) land vehicles, including automobiles, trucks, and farm vehicles, offer many direct societal benefits, including but not limited to improved ground transportation safety, reduced traffic congestion, reduced emissions and negative environmental impact, increased mobility, and increased business efficiency and productivity. For these benefits to be realized, unmanned land vehicle technology must advance significantly – especially for vehicles used to transport people.

Maritime Systems Potential

Current growth in this domain is primarily military for both Unmanned Surface Vehicles (USV) and Unmanned Underwater Vehicles (UUV). Virginia firms and Navy labs play a major role in this work. On the civilian side, Rolls Royce and the European Union are each investing in research aimed at unmanned cargo ships. Other potential commercial applications include underwater mapping, search operations, environmental data gathering, fish counts, oil rig support operations, undersea cable monitoring and repair, harbor security, port patrol and life guard operations.

Aerial Systems Potential

Applications of UAS are numerous from military use to civilian applications such as precision agriculture, pipeline and power line monitoring, aerial photography, public safety, search and rescue, firefighter

situation awareness, and more. Aerial photography using UAS is commonplace today. Much has been said in the press about the desirability for future commercial deliveries via UAS from companies such as Amazon, Flirtey, Google and Walmart.

Platform Agnostic Potential

While significant research and development activity is taking place within each domain of UMS, these domains call upon common sets of skills and technologies. For example a skilled software engineer will find relevance whether the subject is an automated automobile, unmanned underwater vehicle, or an aerial vehicle. Innovation in these platform agnostic areas will grow in importance as UMS systems mature and move into increased commercial deployment. Growth opportunities will develop in areas including education, software, cyber security, advanced materials and advanced manufacturing, sensors, system integration, control logic, autonomous systems, communications, and business services.

Virginia Value Proposition and Marketing

Findings (Marketing)

Virginia is an attractive market location offering many high quality customers and easy access/channels to customers/partners. Our attributes:

- Northern Virginia is the center of the universe for Federal agencies and large enterprises that sell to Federal agencies with close proximity to Washington, DC stakeholders.
- The Mid-Atlantic Aviation Partnership (MAAP), an Federal Aviation Administration (FAA) designated UAS test site, provides research and range services and operates multiple UAS operating areas across the state.
- Access to waters ranging from marshes and shallow rivers to oceanic for maritime systems.
- Virginia Automated Corridor roadways and other facilities for automated vehicle testing.
- Home to universities, small companies, large firms, and federal and defense facilities that are advancing aerial, land, and maritime vehicles, autonomy, manufacturing, and servicing.
- Proximity to defense agencies funding the development of future generations of unmanned systems for the warfighter, including Defense Advanced Research Project Agency (DARPA), Office of Naval Research (ONR), and Naval Surface Warfare centers Dahlgren and Carderock.
- Close proximity to system users, including numerous defense installations and assets, for rapid prototyping, testing, and feedback.
- A family friendly locale with low cost of living in vibrant city locations.
- Close proximity to many use cases including defense, first responders, energy and roadway infrastructure inspection, Geographic Information System (GIS) needs, Chesapeake Bay resource protection, and a nascent offshore energy industry.

In the aerial systems domain, Virginia leads the nation in the deployment of UAS for humanitarian package delivery. In July 2015, the first FAA-approved medical package delivery in the United States took place in Wise County, Virginia during the Remote Area Medical Clinic. The partnership lead by Flirtey included the MAAP, the Remote Area Medical (RAM) Clinic, and NASA. The research flights at the annual RAM free medical clinic provided a wealth of data to support the development of medical package delivery application standards. Flirtey, (an Australian firm) chose Wise County, Virginia (over other U.S. locations) in part due to the Virginia support, the flight opportunities, and the research environment. Flirtey is now actively exploring further research and development in Virginia for humanitarian services.

Another activity has begun (with the support of the Office of the Secretary of Technology) between Albemarle County, Piedmont Virginia Community College, Virginia Department of Emergency Management (VDEM), and MAAP to develop training to allow public safety officials to operate UAS during incident response. This program will also include a certification that allows private entities with a Section 333 exemption³ to operate and participate with emergency response personnel. Potential program benefits include: (1) enhanced public safety and lifesaving; (2) providing a “pull” for UAS services to encourage service providers and innovation; (3) fostering public awareness of the beneficial uses of UAS; and (4) fostering similar technology and procedures to enable a plethora of other beneficial UAS missions including precision agriculture and critical infrastructure inspection.

In the domain of land vehicles, the Virginia Tech Transportation Institute (VTTI) and the Commonwealth have made vast strides in paving the way for automated-vehicle developers who wish to have ease of access to robust and unique testing facilities and a favorable regulatory environment. The VTTI has spent more than two decades performing work focused on advanced vehicular technology. During that timeframe, institute researchers have conducted projects with 10 of the 11 major automakers and individual suppliers to help test and/or develop next-generation vehicular systems. In 2015, VTTI and various partners launched the Virginia Automated and Connected Corridors. The institute also unveiled the Center for Automated Vehicle Systems in 2013, which was created specifically to work collaboratively across the Virginia Tech campus and the Commonwealth to study the human factors and cybersecurity issues relative to the development and deployment of automated vehicles.

In maritime systems, Virginia’s waters, universities, industries, and defense installations are a hub of high technology and autonomous maritime systems research, development, and deployment. The Defense Advanced Research Project Agency, the Office of Naval Research, and organizations from New England and Pennsylvania come to the Hampton Roads waters to test. The Tech Center in Newport News⁴ is a growing, prestigious research park for high-technology companies that advance the research, educational and technology transfer missions of the university including the Virginia Tech expertise in autonomous maritime systems.

In platform agnostic technologies, a vast array of capabilities stand to benefit the industry and provide opportunity for Virginia. Significant opportunity is present in platform agnostic areas including education, software, cyber security, advanced materials and advanced manufacturing, sensors, system integration, control logic, autonomous systems, communications, and business services. Virginia has a

³ By law, any aircraft operation in the national airspace requires a certificated and registered aircraft, a licensed pilot, and operational approval. Section 333 of the FAA Modernization and Reform Act of 2012 grants the Secretary of Transportation the authority to determine whether an airworthiness certificate is required for a UAS to operate safely in the National Airspace System (NAS). This authority is being leveraged to grant case-by-case authorization for certain unmanned aircraft to perform commercial operations prior to the finalization of the Small UAS Rule, which will be the primary method for authorizing small UAS operations once it is complete.

⁴ Tech Center is a 100-acre, mixed-use development. The concept is a hybrid that fuses the best components of today’s research parks and innovation districts to create a new, unique environment encompassing neighborhood living, as well as retail, recreation and dining. By promoting the growth of a creative-minded community, Tech Center will become a place to collaborate, exchange ideas and encourage high-tech entrepreneurship. Tech Center’s \$450-million-dollar investment will include a 50-acre Tech Center Research Park under construction, a dedicated marketplace in place, and 285 high-end residential units. The public-private partnerships include several of the strongest and most experienced development firms in the region, including W. M. Jordan, S. J. Collins, and Ellis-Gibson, together with the City of Newport News and scientific powerhouses like Jefferson Lab and the Virginia Tech Corporate Research Center. See <http://techcenterva.com/>

unique combination of an excellent educational system, strengths in all UMS domains, and strength in cross-domain technology areas critical to long-term sustained growth of the industry.

Barriers (Marketing)

Currently, support for advancing Virginia's leadership in UMS is happening on an ad hoc basis. The Commonwealth lacks the existence of a single, unified voice for the UMS industry as seen in other states. There is currently no dedicated individual or organization with both domain expertise and resources for maintaining market intelligence, marketing, and serving as an advocate for UMS firms both resident and potential entrants to the Commonwealth, and otherwise fostering the growth of the UMS industry across the breadth of domains and assets that Virginia has to offer.

Virginia currently has a plethora of "voices" advocating for specific UMS organizations, businesses, and institutions. There is little to no coordination of the goals/messages which consequently leads to mixed messaging. The Commission discussions have uniformly recognized the need for a singular, dedicated voice for the unmanned systems industry in Virginia. This function is seen as much more than a single entry point for inquiries. Rather, the entity should actively develop relationships in the industry and seeks out firms to listen, understand barriers and needs and plans for expansion, and identify the Virginia value proposition for expressed needs. The need for this function is recognized, but the "form" is still to be determined. Options range from altering the responsibilities of an existing state organization/agency to creating a new, completely independent trade association model in the vein of Virginia Bio. The Commission will recommend the required functions, attributes, and structure of this voice. Initial functions and attributes include:

- Gathering market intelligence and awareness of activities, particularly in the Commonwealth, but also outside the state.
- Establishing Virginia's competitive advantage.
- Fostering opportunities and removing barriers for Virginia firms.
- Recruiting and aiding firms from outside Virginia.
- Developing and adjusting global business and marketing strategies.
- Coordinating across all Commonwealth assets to assist UMS firms, including leveraging the capabilities of existing organizations such as VEDP.
- Identifying legislative barriers and advocating for an appropriate legislative environment.
- Aiding firms seeking to do research, development, relocation to Virginia, and testing (air/land/sea) – the "easy button" for workforce, incentives, and navigating the processes and multiple agencies associated with air, land, or maritime testing.
- Championing workshops, forums, Science, Technology, Engineering and Math (STEM) events, and summits to foster the industry and the innovation ecosystem.
- Accepting and protecting proprietary information, not subject to Freedom of Information Act (FOIA) release.
- Transparency.
- Providing objectivity with minimal conflict of interests (Commonwealth optimization - asset agnostic).

Recommendations (Marketing)

Formulate and implement a comprehensive marketing campaign. This campaign should include both outreach and communication of our many strengths and capabilities, and also a listening component to better understand the needs and growth opportunities of small and large firms to validate our marketing and investment priorities. A first step, the 2014 report "The Future of Unmanned System in

Virginia”, has been updated to create the 2016 report “Unmanned Vehicle Systems in Virginia”. Virginia should support “just do it” activities recently begun to become the leading state in providing UAS access to humanitarian missions and first responders. Within the field of UMS this activity stands to become high visibility and demonstrate the Virginia commitment to private-public partnerships, beneficial uses of UMS, and responsible UMS policy and legislation. Virginia should support the activity begun in Wise County for UAS package delivery services as well as those in Albemarle County to develop the training and certification processes to enable emergency responders to quickly call upon qualified assets in emergency situations, knowing the standards and protocols developed as part of this program will be transferable to emergency operations nationwide, offering market opportunities to companies and industries represented in the Virginia trials. Research accomplished for this application will certainly be transferrable to others, giving Virginia further advantage in the UAS domain.

Virginia should continue to foster the UMS systems industry supporting the Department of Defense (DoD) due to the magnitude of DoD investments in UMS, the significant presence of military customers and defense leadership in Virginia, the activities of defense companies to identify civil applications for their UMS technologies, and attraction of firms and research capabilities that will also provide the UMS technologies for those emerging civil applications. One example of this transition is CACI International, headquartered in Virginia, which has been awarded an FAA Pathfinder effort to evaluate technology to passively detect UAS near airports. The technology was first developed for defense purposes.

Marketing suggestions from Commission members include:

- Increase exposure in industry and trade magazines.
- Invite industry writers to a road show and travel the state to talk to UMS companies about their activity and impacts.
- Have a robust presence at national trade shows. Rather than a booth that broadcasts, consider a hospitality suite with a Virginia cluster for feedback from companies.
- Conduct an UMS Summit, Virginia or Mid-Atlantic in scope, to build on the successful Cyber-UMS Technology Showcase⁵.

Innovation and Business Environment

Findings (Business Environment)

For both large and small companies effective and timely state incentives play a potentially large role in the decision process associated with making required investments to enter and/or sustain presence in new or evolving markets. Incentives can be *financial* in nature (e.g., grants, tax relief, fee reductions or waivers, and matching investments) or *non-financial* (e.g., streamlined and/or preferred permitting process status, favorable regulatory positions, research sharing, and access to reciprocity arrangements with other states and/or federal organizations). Given that the unmanned vehicle markets for air, land and sea are typically all capital intensive, high technology markets requiring a unique combination of collaboration and competition across the market space, it appears that the following incentives at the disposal of the state would be the most relevant:

- Research Grants
- Capital Investment Incentives
- State, Federal, Industry Collaboration Agreements
- Targeted Work Force Development Incentives

⁵ The Virginia Cyber-UMS Technology Showcase was held September 30-October 1, 2015 at the John Tyler Community College Chester Campus, Chester, VA. Agenda and presentations are available at: <https://vus.virginia.gov/news-events/2015-cyber-security-unmanned-systems-showcase-presentations/>

- Potential Land Grants for Infrastructure and Facilities Investments
- Streamlined permitting processes

Incentives currently available in Virginia are generally geared toward companies with larger capital and job growth numbers and other requirements such as wage levels and project competitiveness. Success metrics are often tied to job growth and capital investment. For nascent industries these numbers are difficult to attain.

The threat of continued reductions in Federal funding mandates that the Virginia economy must reduce reliance on those funds. Interestingly, cyber security (another Commonwealth priority) and UMS appear to be two areas where federal spending growth is projected for the foreseeable future. Several factors argue for continued attention to the DoD market; (1) in maritime systems, defense uses are estimated to be responsible for upward of 90% of the UMS activity in Hampton Roads; (2) the reduction in defense spending is also creating an incentive for defense contractors to explore civil uses of their technology; and (3) the sheer size of the market dictates continued attention to its needs. To give a feel for just one piece of that potential market with no delineation as to potential impact on Virginia, the DoD's Unmanned Systems Integrated Roadmap⁶ FY 2013 – 2038 shows the proposed President's Budget at that time for FY 14. Breaking down budgets for unmanned air, ground, and maritime components of DoD from FY 14 through FY 18, the projected annual budgets for all of these DoD sectors was between \$4B and \$5B per year. Virginia is heavily engaged in DoD unmanned systems work spanning projects at DARPA, ONR, Naval Surface Warfare Dahlgren and Carderock, and others. Combined with the proximity to Washington, DC and the significant presence of defense customers in Virginia, DoD UMS markets provide both a lucrative market to nurture and a springboard to civil UMS research and deployment into new markets.

Barriers (Business Environment)

Barriers include a lack of stage appropriate financial and non-financial incentives for small firms in an emergent industry, and for larger firms seeking to enter this new market. Small firms in both the maritime and aerial domains have also cited a need for greater access to simple, low-cost or free testing. Large, non-defense firms also will respond to appropriate financial and non-financial incentives.

Recommendations (Business Environment)

Available incentives should include both those that are *financial* in nature and *non-financial*. Retention and growth of existing firms must be given attention as well as attraction of external firms.

Industry wants to be close to its customers. Create incentives for Virginia organizations to adopt unmanned systems usage where the business case creates a pull for unmanned systems services. Emergency management, Virginia highway construction and management, GIS services, agriculture, and port security are attractive targets for aerial, land based, and maritime UMS deployment and will foster all major aspects of the industry (training/certification, services, and data analytics as examples).

The following suggestions have been put forth within the Commission but are yet to be prioritized and vetted:

- Enhanced tax incentives for research development (make it easy to qualify/attain).
- Preference to disadvantaged business groups, e.g., Veteran and Woman Owned small businesses.

⁶ <http://www.defense.gov/Portals/1/Documents/pubs/DOD-USRM-2013.pdf>

- Opportunities that reward teaming arrangements of qualified small businesses with large businesses and Virginia universities.
- Ensure Intellectual Property protection.
- Create an environment/venue for Venture Capital organizations to be exposed to new and innovative technology and provide a forum for active investment.
- Recommendations to facilitate commerce in Virginia: Create ‘accelerators’ that are connected to UAS test sites (not vice versa).
- Simple and little to no cost for air, land and water space access & other testing with assistance in navigating the various organizations and approvals needed for testing.
- Maintain a policy and regulatory environment conducive to innovation and testing of this early stage technology.
- Expand the Research and Development Tax Credit for large, innovative companies – Virginia’s current R&D tax credit supports small, start-up companies who require and value a cash refund in the amount of \$35,100. Virginia should create a new, separate R&D credit that brings and supports larger companies to the Commonwealth and helps the state’s biggest employers grow.
- Legislation should conform to the federal Alternative Simplified Credit (ASC) formula and be funded significantly to incentivize innovative companies to operate in Virginia.
- Continue to ensure VEDP programs, like the Governor’s Opportunity Fund, remain fully funded and consider expansion of those funds to draw large companies to the Commonwealth.
- Expand/develop programs to support historical Virginia companies who are retaining jobs in the Commonwealth (see example GrowNJ) through contract awards or other business dynamics.

Education and Workforce

Findings (Education)

The unmanned vehicle markets for air, land and sea are relatively capital intensive, high technology markets that encompass the full value stream of skill sets need for success, including research, design, development, and manufacturing and testing. As such, they represent a subset of the skills and skill shortages being seen across similar markets today in Virginia and elsewhere. The existence of highly skilled Science, Technology, Engineering and Math (STEM) students is critical to building the New Virginia Economy. Light manufacturing skills focused on high quality, unique, and complex capabilities will also be a significant component of the market space. However, similar to other aspects of our current industrial capability challenge, people with tremendous abilities, expertise and experience in Cybersecurity and Mechatronics⁷ will likely be the most challenging skill sets to develop and grow in sufficient quantities to support the potential demand. The extensive use of miniature electronic circuitry in UMS to drive mechanical operations on a scale closer and closer to the interaction of the human brain and its associated body parts will take the emerging field of Mechatronics to a new level in coming years. Similarly, the networked communication (both onboard and offboard) required to support these new capabilities will demand increasingly greater levels of cybersecurity, without diminishing response times below acceptable levels. Non-technical skills are also required during the

⁷ Mechatronics is a multidisciplinary field of engineering that includes a combination of systems engineering, mechanical engineering, electrical engineering, telecommunications engineering, control engineering and computer engineering.

development and deployment of UMS including business development, economics, legal/regulatory analysis, sociology, privacy, and ethics.

Virginia possesses an excellent educational system with close to two dozen universities and community colleges offering relevant certification and degree programs. These programs span the entire UMS supply chain from research, engineering, autonomous systems, testing, operator training, software and data analytics, and cyber security. Anecdotally, demand for these skills is well in excess of supply at this time with numerous firms indicating difficulty in hiring the skills needed in the quantity needed.

Barriers (Education)

Although Virginia possesses an excellent educational system and highly qualified technical workforce, skill shortages are being seen across similar high-technology markets today in Virginia and elsewhere. A challenge to growth is in developing and growing skill sets in sufficient quantities to support the potential demand.

Recommendations (Education)

1. Develop programs in unmanned systems technologies. This could run the gamut from vehicle design to software applications to marketing specialties.
2. Develop incentives for cooperation across state colleges and universities to reciprocally recognize credits in specially tailored degree fields.
3. Take advantage of the synergies between the workforce required by this segment and the population of Virginia's universities, colleges, community colleges and the educators who train them. Establish in Virginia the virtual equivalent of a Research Triangle Park that would facilitate research, development, test and evaluation of unmanned systems.
4. Ensure that the major universities within the state have curriculum that is well-known and prestigious for unmanned systems. There is a significant amount of small businesses that are created near universities. This allows for bright, young talent that can be working and creating jobs while going to school.

Policy and Regulatory

Findings (Policy)

In the aerial domain, Congress mandated the acceleration of the entry of unmanned aircraft systems into the National Airspace System (NAS), requiring the safe integration of civil UAS into the NAS as soon as practicable, but not later than September 30, 2015. Since that time, much attention has been focused on the Federal Aviation Administration. Today commercial UAS operations are conducted under an exemption process authorized by Section 333 of the FAA Modernization and Reform Act of 2012. Within Virginia approximately 60 companies are operating commercially under Section 333 exemptions. The FAA has announced that it will require registration of UAS, including recreational devices.

In the ground vehicular domain, in May 2013, the National Highway Traffic Safety Administration (NHTSA) issued its Preliminary Statement of Policy Concerning Automated Vehicles. NHTSA acknowledges that "several states have enacted legislation expressly authorizing operation of autonomous vehicles within their borders under certain conditions." The policy states that "NHTSA has considerable concerns however about detailed state regulation on safety of self-driving vehicles for purposes other than testing." It further states that the regulation of the technical performance of automated vehicles is premature at this time. There is evidence that states that have prematurely passed regulations addressing automated vehicle testing are now at a disadvantage relative to Virginia.

The Governor of Virginia issued a proclamation on March 4, 2015 in support of the Virginia Tech Transportation Institute and Automated and Autonomous Vehicles. In this proclamation Governor Terence R. McAuliffe declared that the Commonwealth of Virginia supports the mission of the Virginia Tech Transportation Institute Center for Automated Vehicle Systems and its self-driving on-road studies, and is open for business for the vehicle and technology manufacturers and researchers committed to the development, testing and deployment of automated and autonomous vehicles.

Unmanned maritime systems are covered by the U.S. Coast Guard International/Inland Navigation Rules and International Maritime Operations Regulations for Preventing Collisions at Sea. Requirements are the same for manned and unmanned vessels. The Coast Guard official in charge in Virginia is the Captain of the Port of Virginia. State boating law is under the Department of Game and Inland Fisheries. They have not been called upon to address unmanned systems to date.

Barriers (Policy)

Realization of the tremendous promise of positive benefit from unmanned systems is challenged by negative public perceptions, primarily in privacy and safety. While these must be addressed, we must move forward in a way that captures positive public reaction and builds on it for all of the domains – land, water and air. We must focus public attention on the value proposition while ensuring that safety, security and constitutional rights will be preserved during the deployment of the technology.

Many who work in the field believe that regulating prematurely – before a technology is sufficiently mature – discourages innovation and development.

Recommendations (Policy)

Mitigations identified as relevant by the Policy and Regulatory Working Group are:

- Avoid implementation of policy and regulations before technology has matured.
- Do not establish laws or regulations that limit, constrain, or restrict the development, test, and use of unmanned land vehicles.
- Do not establish laws or regulations with the intention of encouraging development and test, such as explicitly allowing the test of unmanned land vehicles on public roads under specific conditions. Although well intentioned, such laws and regulations over time could restrict or complicate the transition from test to operational use.
- Focus on how information is used rather than on the platform from which it is acquired.
- Improve regulatory clarity.
- Prevent negative public impact when testing – such as waterway blockages.
- Accelerate release of standards for certification of all classes of UAS.
- Deploy a public relations campaign aimed at balancing negative press with a focus on positive aspects of UMS
 - Emphasize safety, convenience, cost benefits
 - Be consistent with terminology – avoid using the word “drone”
 - Jointly sponsor and publicize demonstrations aimed at familiarizing the public with beneficial UMS applications such as lifesaving and emergency response.
- Set up a UMS event for the Virginia Legislature.
- Review existing laws and regulations to determine if any may intentionally or unintentionally limit, constrain, or restrict the development, test, and use of unmanned land vehicles, and consider relaxing or removing them.
- Establish legislation that prohibits individual Virginia localities from enacting local legislation and regulations regarding unmanned systems.
- Do not require special unmanned vehicle operator licenses at the state or local level.

- Fully leverage existing laws and regulations before introducing new laws and regulations specifically for unmanned systems. For example, leverage existing regulations for vehicle safety, tort law for products liability, and privacy laws for data protection. Before enacting special legislation to protect privacy, determine if existing law can be interpreted to cover UMS.
- Do not require special or additional insurance requirements for unmanned land vehicle manufacturers or operators. The insurance industry has established processes for assessing new and evolving risks and providing appropriate insurance offerings at appropriate rates. It should be allowed to operate and innovate within the established regulatory bounds.

Going Forward

Going forward, the Commission will prioritize the interim recommendations provided here and develop the specificity required for execution.

Several priority actions in Virginia are underway and will be accelerated, both informing the deliberations of the Commission and being informed by the Commission:

1. The 2014 report “The Future of Unmanned Systems in Virginia” has been updated to create the 2016 report “Unmanned Vehicle Systems in Virginia”. This update includes a comprehensive listing of Virginia UMS assets including universities and community colleges providing relevant certifications or degrees, test assets for air, automotive and maritime vehicles, DoD facilities using or conducting research in UMS, and available incentives. Current asset lists, found at <https://vus.virginia.gov>, will be completed and published.
2. Creation and approval of an effective UMS marketing campaign.
3. Definition and implementation of a singular “voice” as an advocate of the UMS industry in Virginia.
4. Development of the education and certification programs and Commonwealth registration of qualified providers of UAS support for first responders.
5. Establishment of an integrated survey of the educational institution capabilities in Virginia as they relate to the UMS supply chain and defining opportunity for these institutions to work together, grow capability where needed, and nurture the innovation and business ecosystem through internships and partnerships.

The Virginia Unmanned Systems Commission was established to identify the state of the UMS industry in Virginia, identify challenges and needs of the industry that may be met with Virginia assets, provide recommendations that will encourage the development of the UMS industry in Virginia, and develop the value proposition that will provide a basis for marketing and that will position Virginia for emerging needs and applications. The Commission has considered unmanned systems at large including the factors that support the industrial ecosystem, including education, workforce development, economic incentives, development and testing assets, policy, and marketing. The Commission has found significant value within Virginia to all domains of the UMS industry; air, land, and maritime. Several initiatives have already taken place to advance the posture of Virginia. The findings in this report will be the basis both for immediate actions in the marketing space and for focusing the Commission deliberations in the remaining six months to recommend other specific actions, partnerships, and investments required to move the nascent UMS industry forward in Virginia to the benefit of the New Virginia Economy.